



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 252 638
A1

(2)

EUROPEAN PATENT APPLICATION

(21) Application number: 87305525.5

(51) Int. Cl. 4 H01F 7/18

(22) Date of filing: 22.06.87

(33) Priority: 11.07.86 GB 8616965

(43) Date of publication of application:
13.01.88 Bulletin 88/02

(84) Designated Contracting States:
DE ES FR GB IT

(71) Applicant: LUCAS INDUSTRIES public limited
company
Great King Street
Birmingham, B19 2XF West Midlands(GB)

(72) Inventor: Clive, Robert John
21 Partridge Way Beeches Park
Cirencester Gloucestershire GL7 1BH(GB)
Inventor: Emerson, Keith Robert
29 Follyfield
Hankerton Wiltshire(GB)

(74) Representative: Thompson, George Michael et
al
MARKS & CLERK Alpha Tower Suffolk Street
Queensway
Birmingham B1 1TT(GB)

(54) Drive circuit.

(57) A drive circuit for an inductive load I0 includes a switching device I2 connected in series with the load and controlled by a constant frequency oscillator I6. The mark:space ratio of the signal supplied to the switching device by the oscillator can be varied in accordance with the output of a comparator I8 which compares the measured instantaneous value of the current flowing in the load with a calculated value of the current.

EP 0 252 638 A1

"DRIVE CIRCUIT"

This invention relates to a drive circuit for an inductive load, the drive circuit being of the so-called constant frequency type and including a switching device connected in series with the load and a source of supply.

It is frequently necessary to control and vary the average current flowing in the inductive load and this can be achieved by varying the mark/space ratio. The difficulty arises in providing a measure of the average current since from the instant of switch on the current will increase exponentially in the load and if a flywheel diode is provided, from the instant of switch off will also decrease exponentially.

The object of the invention is to provide a drive circuit in a simple and convenient form.

According to the invention a drive circuit of the kind specified includes means for measuring the instantaneous value of the current flowing in the device at or after a predetermined time following switch on and means for comparing the measured instantaneous value of current with a calculated value of current, and further means for adjusting the mark/space ratio to achieve the desired average current flow in the load.

An example of a drive circuit in accordance with the invention is illustrated in the accompanying circuit diagram.

The drive circuit is intended to control the current flowing in an inductive load represented by the inductor I0, the inductive load being for example a proportional solenoid. One terminal of the load is connected to a d.c. supply line II and the other terminal of the load is connected by way of a switching device I2 and a resistor I3 connected in series, to the other supply line I4. The switching device may comprise a transistor. In addition, in parallel with the load I0 is a flywheel diode I5.

A constant frequency oscillator I6 is provided and this is connected to one input of a control circuit I7 the output of which controls the operation of the switching device I2. The control circuit also has an input which is connected to the output of a comparator I8 by way of an integrator I8A and one input of the comparator is connected by way of a switch I9 to a point intermediate the switching device I2 and the resistor I3. The other input of the comparator is connected to a reference source 20 and the operation of the switch I9 is controlled by the output of the oscillator I6.

In use, the control circuit I7 provides a square wave output signal to drive the switching device I2, the mark/space ratio being controlled by the output of the comparator I8 by way of the integrator I8A. The reference source 20 provides a voltage repre-

sentative of a desired instantaneous current to one input of the comparator and a voltage representing the actual instantaneous current in the load, is applied to the other input of the comparator by way of the switch I9 at the instant the switching device I2 is turned on or at a predetermined time after it has been turned on but before it is turned off. The voltage developed across the resistor I3 is representative of the instantaneous value of current and this is compared by the comparator I8 with the desired instantaneous value. Any deviation between the actual and desired value is corrected by adjustment of the mark/space ratio, the instantaneous value of the current being representative of the average current flowing in the load I0.

The reference voltage supplied by the source 20 is predetermined for given circuit conditions and any deviation of the circuit conditions tending to cause a variation in the average current flowing in the load I0 will be corrected by the circuit. For example, if the supply voltage should fall which would, in the absence of any correction, cause a reduction in the average current flowing, the mark/space ratio will be adjusted to cause the average current to be restored to the desired value.

The operation of the control circuit may be controlled by a micro-computer which from the feedback signal representing the instantaneous value of current in the load I0 can control the control circuit I2 to obtain the desired average current flow in the load I0.

Claims

I. A drive circuit for an inductive load the drive circuit being of the so-called constant frequency type and including a switching device connected in series with the load and a source of supply, characterised by means I3, I9 for measuring the instantaneous value of the current flowing in the device at or after a predetermined time following switch on, means I8 for comparing the measured instantaneous value of current with a calculated value of current, and further means I7 for adjusting the mark/space ratio to achieve the desired average current flow in the load.

2. A drive circuit according to Claim 1 characterised in that the means for comparing comprises a comparator I8 the output of which is supplied by way of an integrator I8A to said further means I7, the comparator having one input connected to a reference voltage source 20 which supplies a voltage representative of the calculated value of cur-

rent and a further input which receives a voltage representative of the measured instantaneous value of the current.

3. A drive circuit according to Claim 2 characterised by a resistor I3 connected in series with the load I0 and switch means I9 through which the voltage developed across said resistor is applied to said further input of the comparator I8.

4. A drive circuit according to Claim 2 including an oscillator for supplying a constant frequency signal, characterised by a control circuit I7 which receives said constant frequency signal and controls the operation of said switching device I2, the output of said integrator I8A being applied to said control circuit I7 to control the mark/space ratio of the signal applied to the switching device.

5. A drive circuit according to Claim 3 characterised in that switch means I2 is controlled by said constant frequency signal.

5

10

15

20

25

30

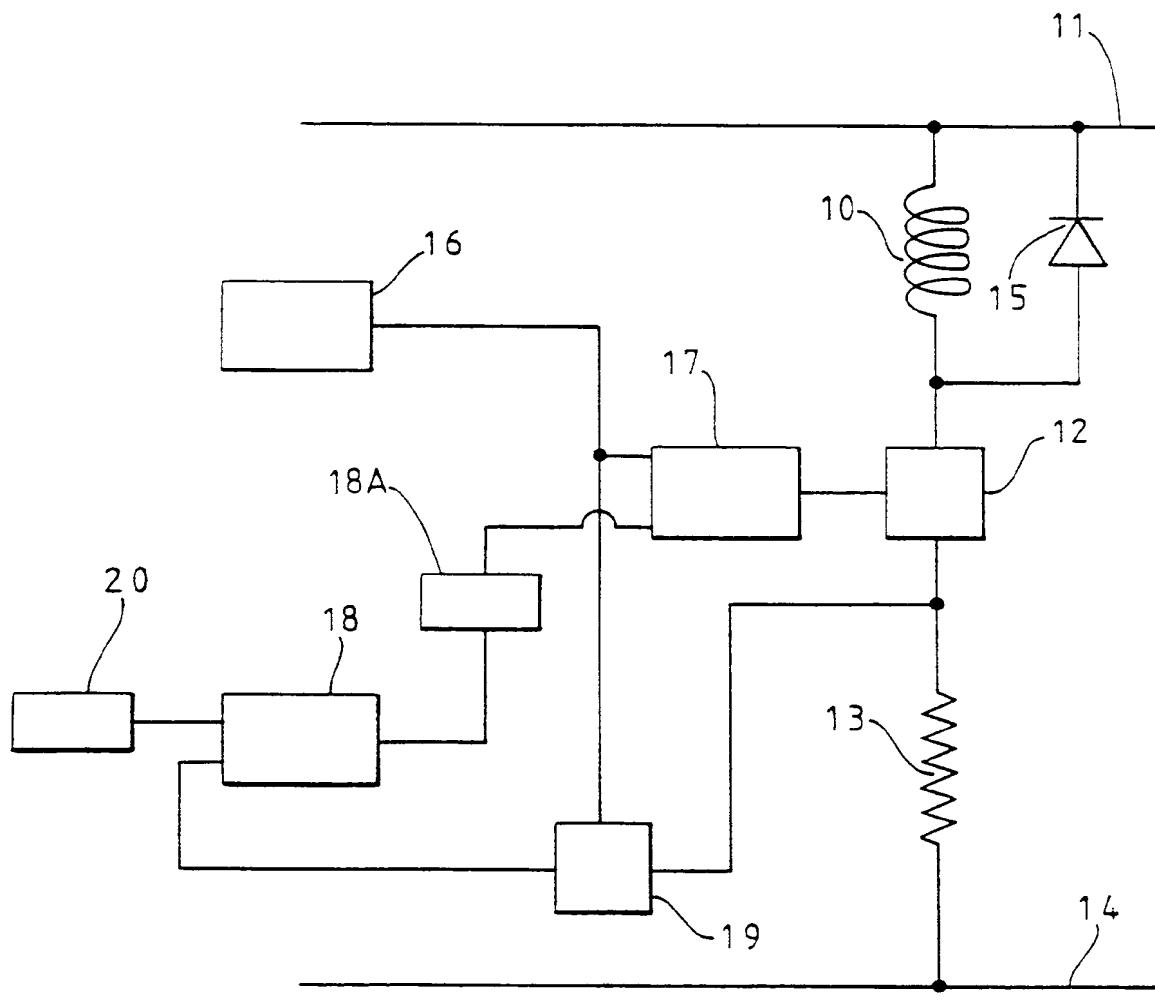
35

40

45

55

2





European Patent
Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 87305525.5
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
A	<u>DE - A1 - 3 423 505</u> (SODECO-SAI A AG) * Abstract; fig. 1; claims 1-6 *	1-5	H O1 F 7/18

A	<u>DE - A1 - 3 503 289</u> (LUCAS) * Abstract; fig. 1 *	1-5	

A	<u>DE - A1 - 3 507 103</u> (FORD) * Abstract; fig. 2,3 *	1-5	

			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			H O1 F 7/00

The present search report has been drawn up for all claims

Place of search VIENNA	Date of completion of the search 08-09-1987	Examiner VAKIL
CATEGORY OF CITED DOCUMENTS		
X : particularly relevant if taken alone	T : theory or principle underlying the invention	
Y : particularly relevant if combined with another document of the same category	E : earlier patent document, but published on, or after the filing date	
A : technological background	D : document cited in the application	
C : non-written disclosure	L : document cited for other reasons	
P : intermediate document	S : member of the same patent family, corresponding document	

